Introducing MAPpoly2 and updates on QTLpoly:

Supplementary Slides

Marcelo Mollinari

Gabriel Gesteira

Guilherme Pereira

Zhao-Bang Zeng

This project is funded by USDA NIFA Specialty Crop Research Initiative Award # 2020-51181-32156 (09/01/20 - 08/31/24)

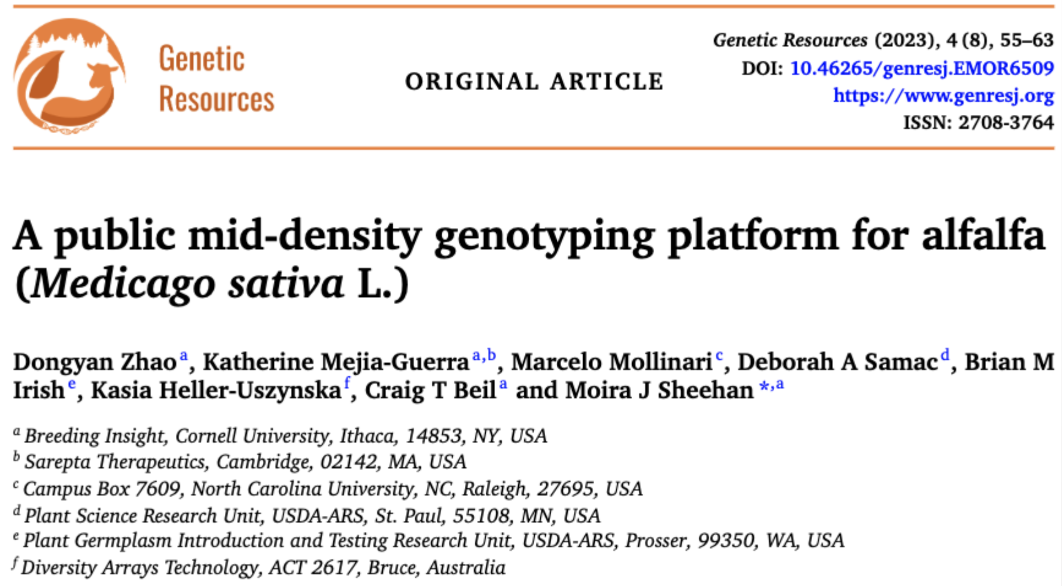
MAPpoly2

GitHub page and Rpubs

- https://github.com/mmollina/mappoly2
- https://rpubs.com/mmollin/tutorial_mappoly2
- https://rpubs.com/mmollin/multi_family_simulation

This project is funded by USDA NIFA Specialty Crop Research Initiative Award # 2020-51181-32156 (09/01/20 - 08/31/24)

Inter-connected tetraploid alfalfa families



Genetic Resources

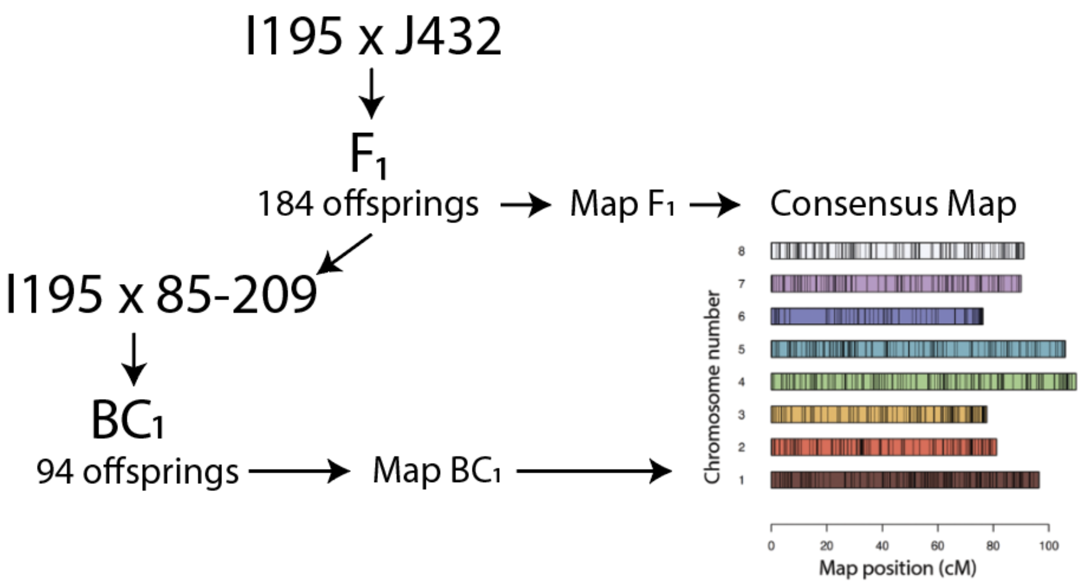
ORIGINAL ARTICLE

Genetic Resources (2023), 4 (8), 55–63
DOI: 10.46265/genresj.EMOR6509
https://www.genresj.org
ISSN: 2708-3764

A public mid-density genotyping platform for alfalfa (*Medicago sativa* L.)

Dongyan Zhao [a], **Katherine Mejia-Guerra** [a,b], **Marcelo Mollinari** [c], **Deborah A Samac** [d], **Brian M Irish** [e], **Kasia Heller-Uszynska** [f], **Craig T Beil** [a] **and Moira J Sheehan** [*,a]

[a] *Breeding Insight, Cornell University, Ithaca, 14853, NY, USA*
[b] *Sarepta Therapeutics, Cambridge, 02142, MA, USA*
[c] *Campus Box 7609, North Carolina University, NC, Raleigh, 27695, USA*
[d] *Plant Science Research Unit, USDA-ARS, St. Paul, 55108, MN, USA*
[e] *Plant Germplasm Introduction and Testing Research Unit, USDA-ARS, Prosser, 99350, WA, USA*
[f] *Diversity Arrays Technology, ACT 2617, Bruce, Australia*



I195 x J432

F_1

184 offsprings → Map F_1 → Consensus Map

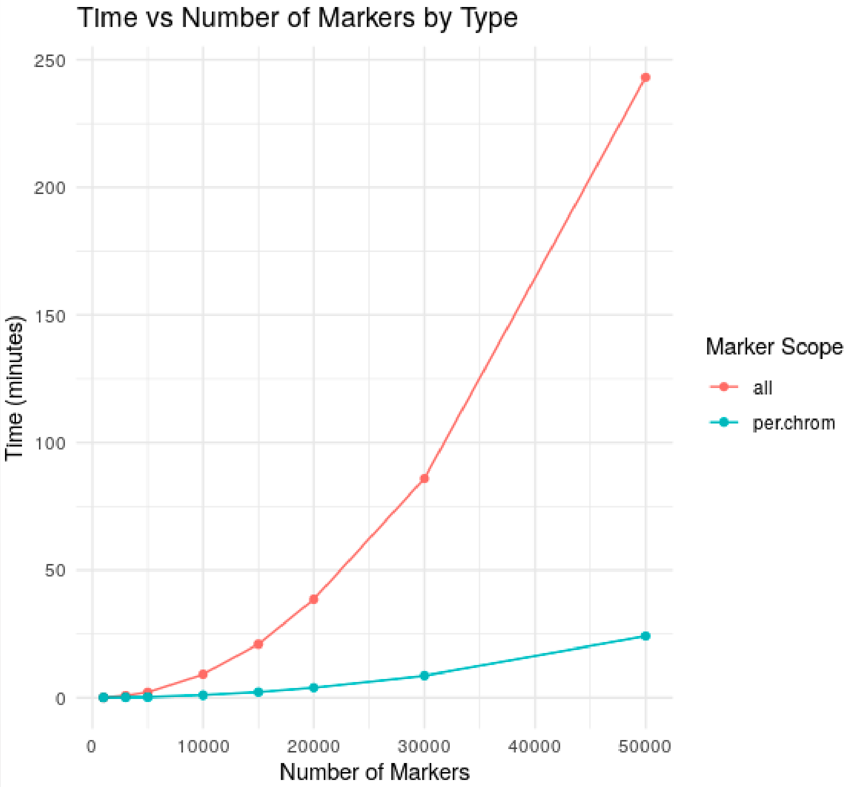
I195 x 85-209

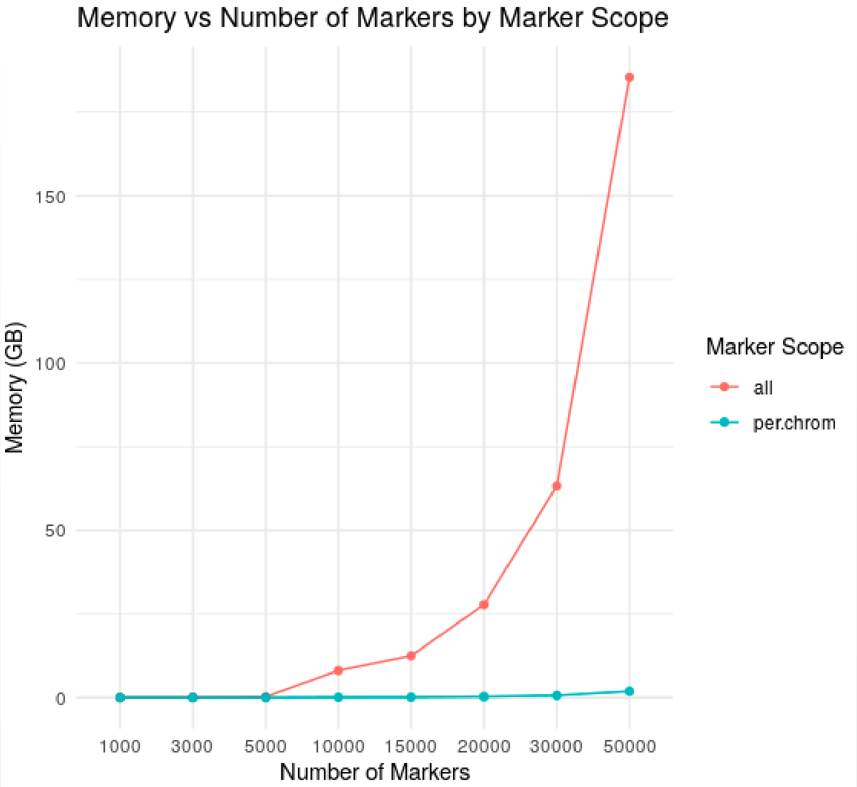
BC_1

94 offsprings → Map BC_1 →

This project is funded by USDA NIFA Specialty Crop Research Initiative Award # 2020-51181-32156 (09/01/20 - 08/31/24)

Pairwise recombination – Time and Memory


Time vs Number of Markers by Type

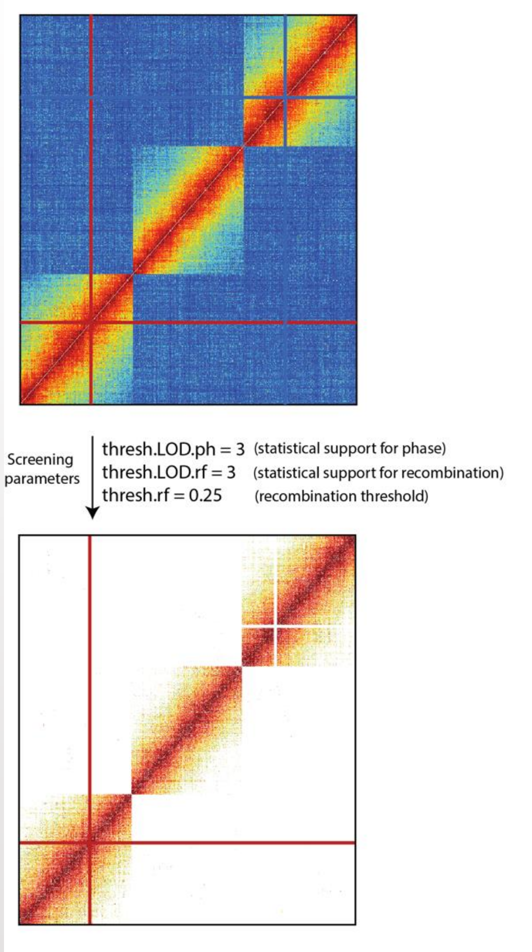

Memory vs Number of Markers by Marker Scope

The simulation results showcased in this Figure were obtained using an Intel(R) Xeon(R) Gold 6226R CPU running at 2.90GHz, combined with 376 GB of RAM and 32 processing cores.

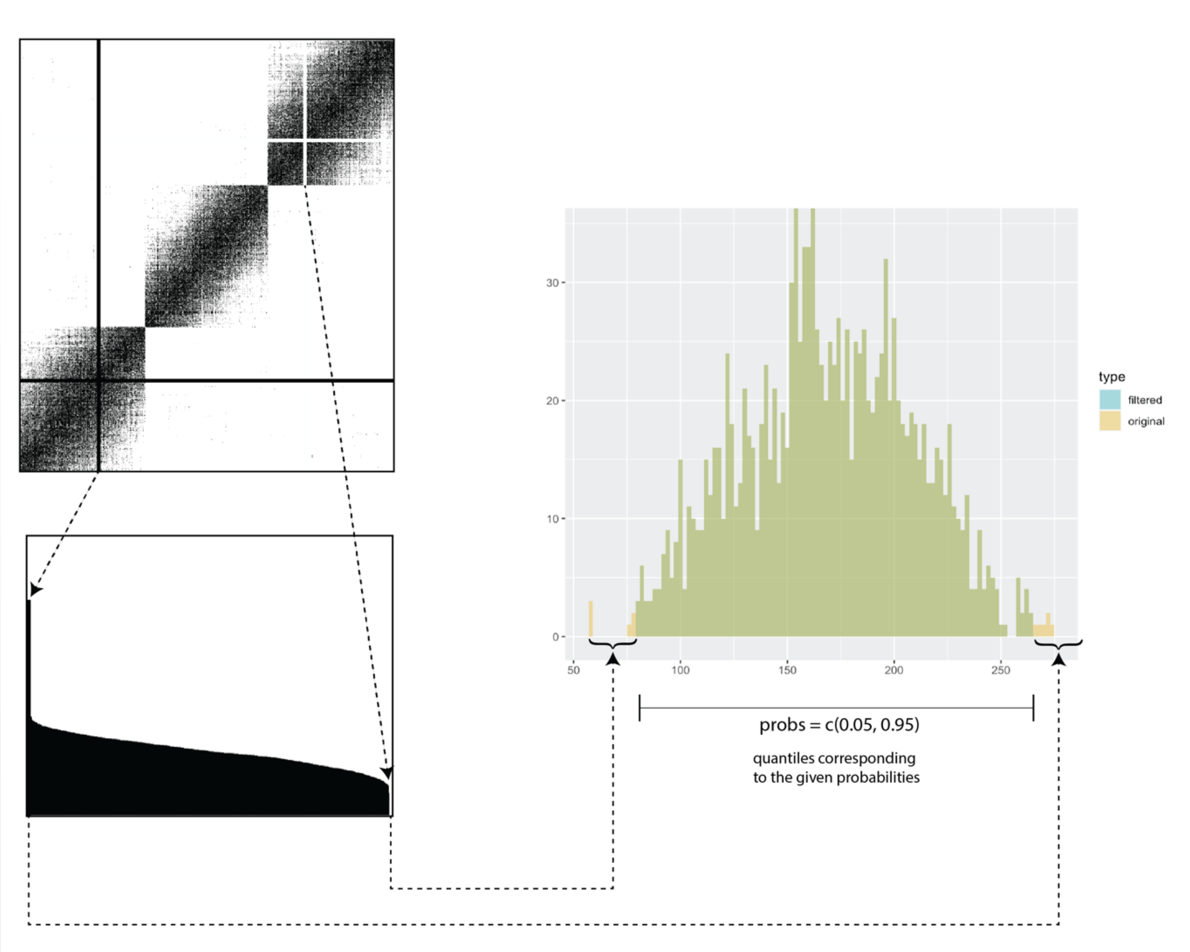
10 chromosomes

This project is funded by USDA NIFA Specialty Crop Research Initiative Award # 2020-51181-32156 (09/01/20 - 08/31/24)

Recombination fraction-based filtering

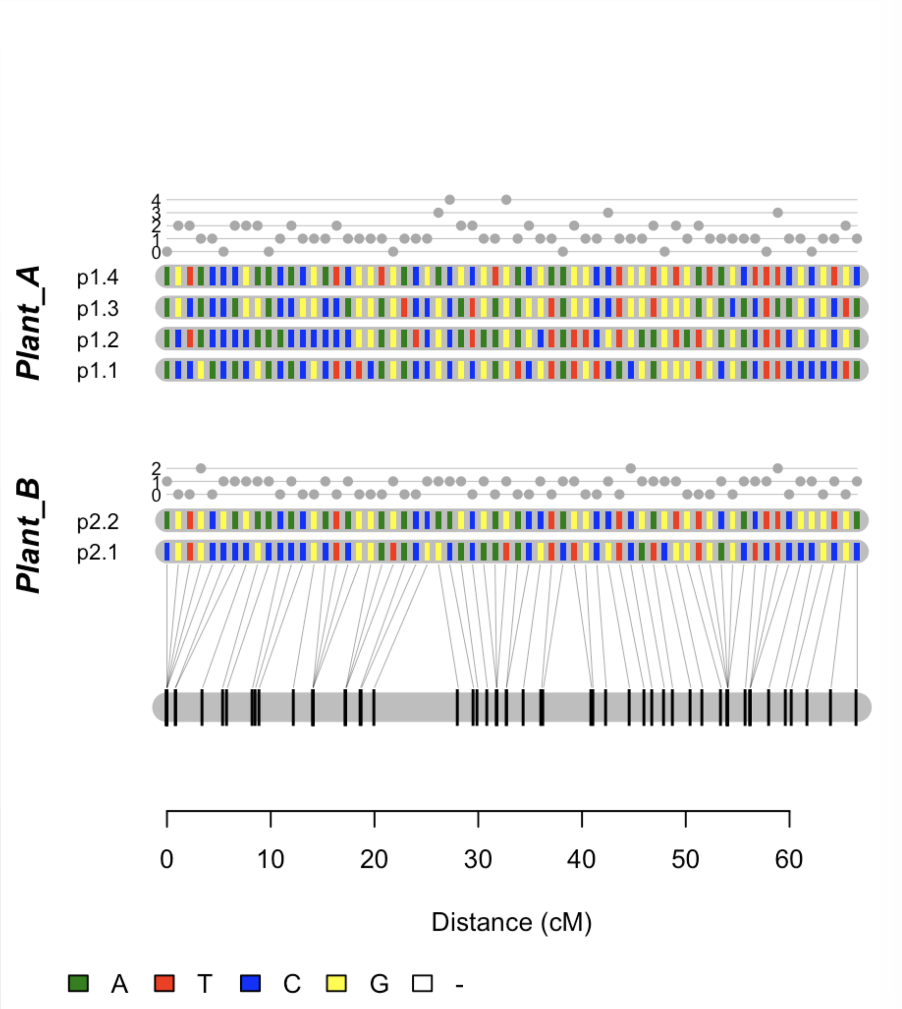


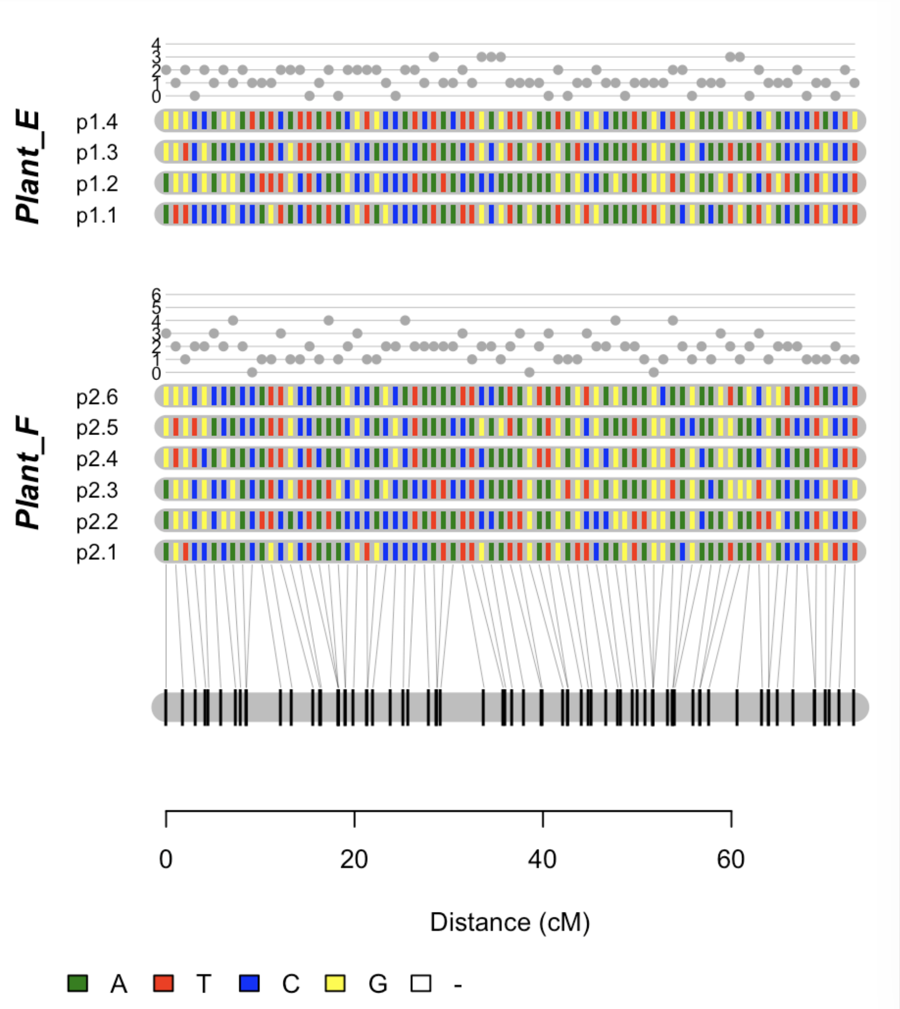
Binarization



This project is funded by USDA NIFA Specialty Crop Research Initiative Award # 2020-51181-32156 (09/01/20 - 08/31/24)

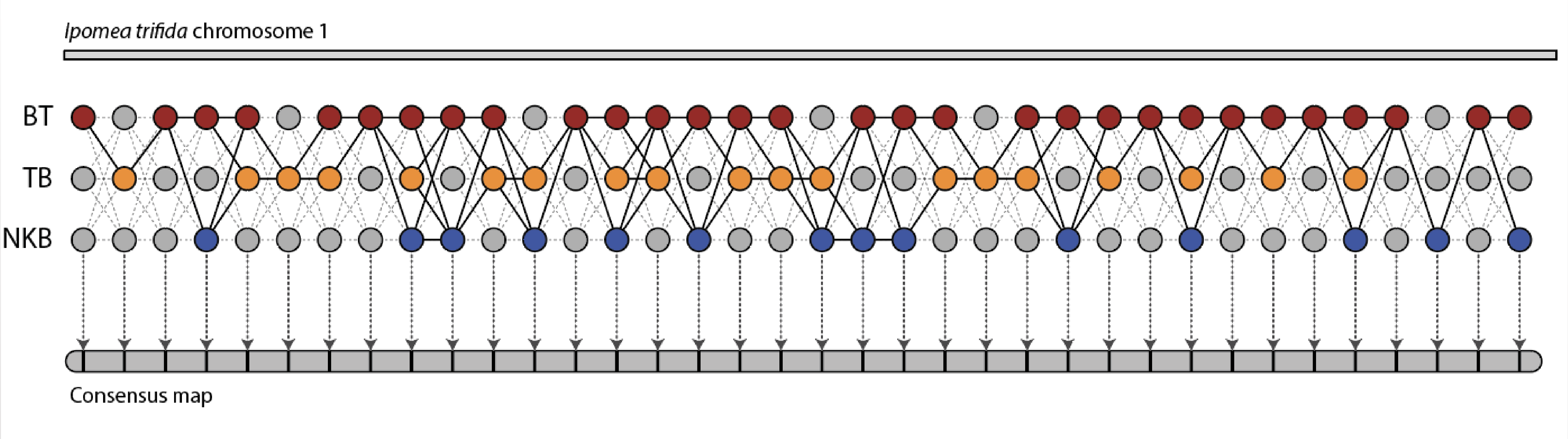
Mixed-ploidy cross: 4 x 2 and 6 x 4





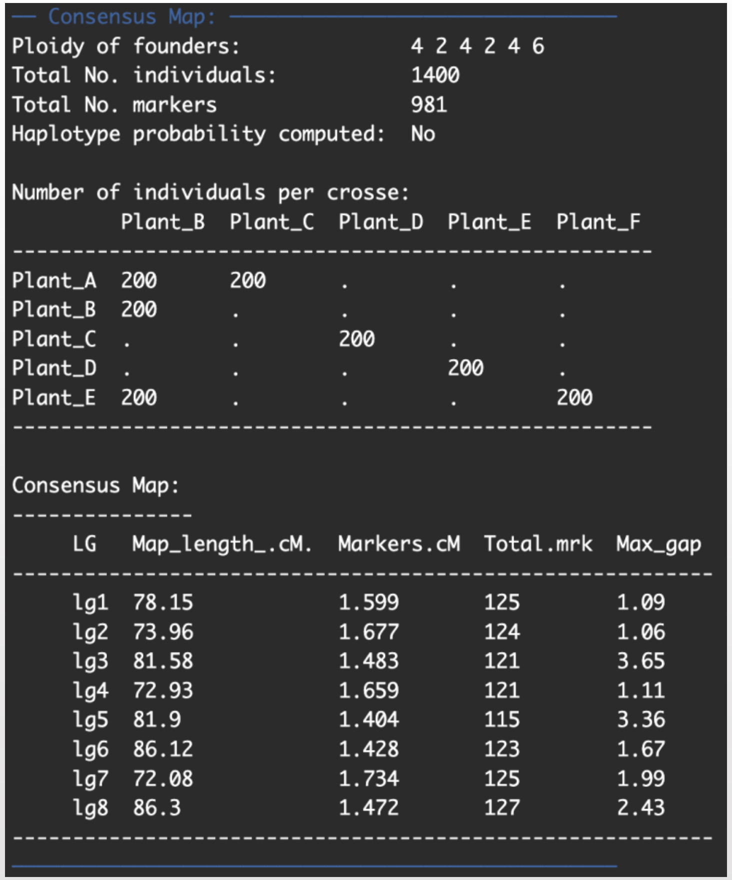
This project is funded by USDA NIFA Specialty Crop Research Initiative Award # 2020-51181-32156 (09/01/20 - 08/31/24)

HMM and propagation of information in multiple maps

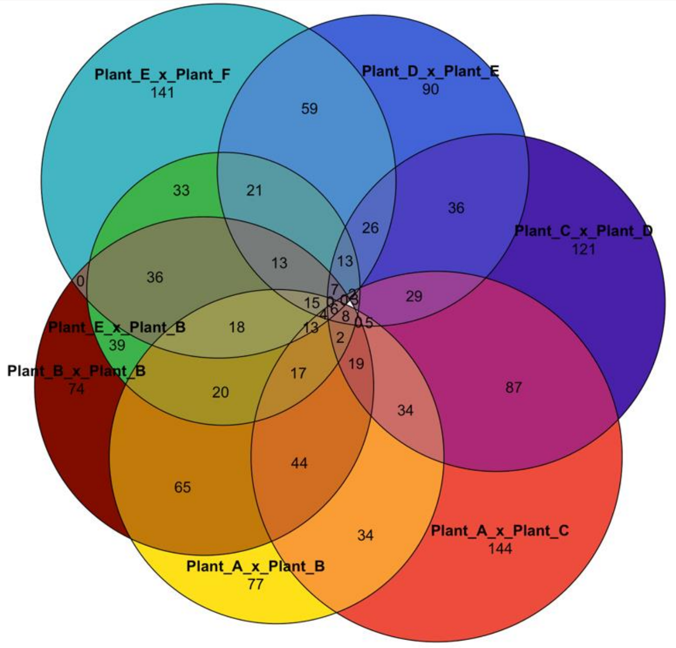


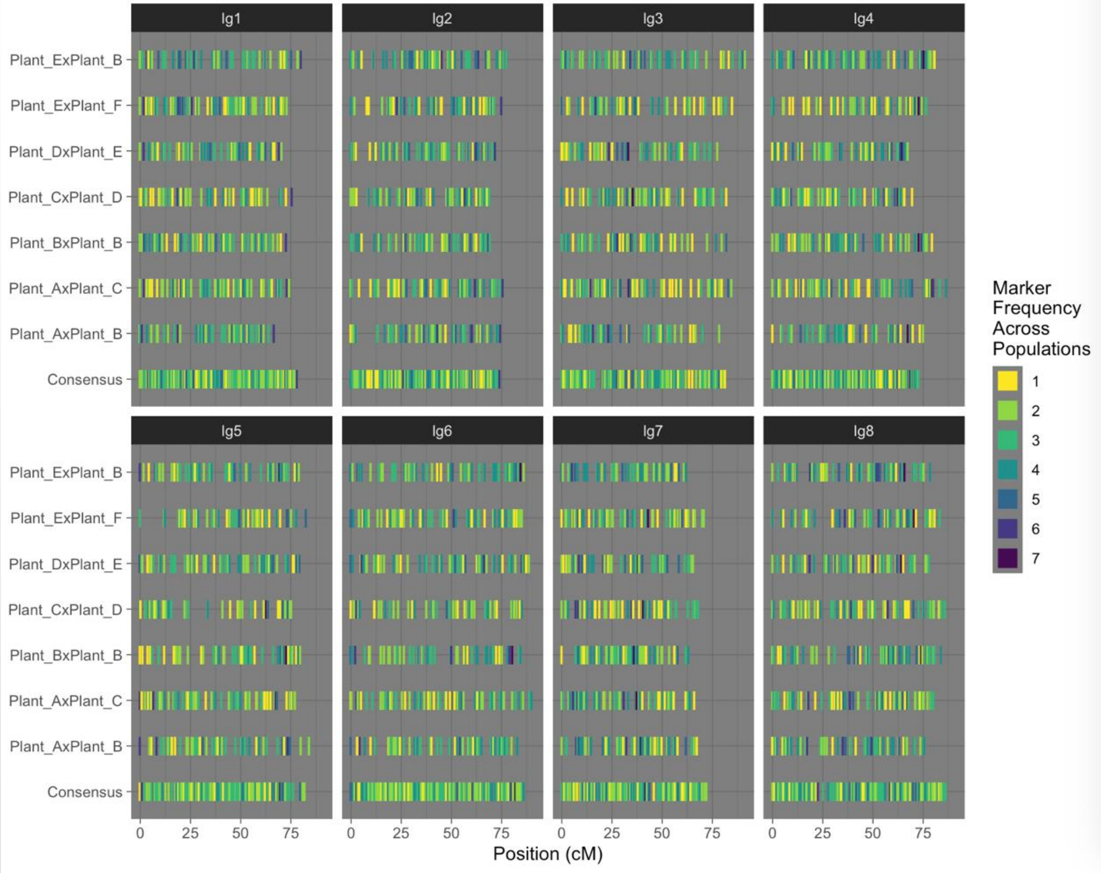
This project is funded by USDA NIFA Specialty Crop Research Initiative Award # 2020-51181-32156 (09/01/20 - 08/31/24)

Seven populations, 6 parents, 3 ploidy levels



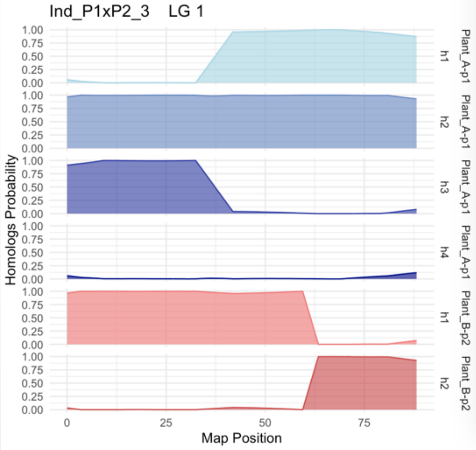
```
── Consensus Map: ──────────────────────────────────────────
Ploidy of founders:              4 2 4 2 4 6
Total No. individuals:           1400
Total No. markers                981
Haplotype probability computed:  No

Number of individuals per crosse:
         Plant_B  Plant_C  Plant_D  Plant_E  Plant_F
-----------------------------------------------------
Plant_A  200      200      .        .        .
Plant_B  200      .        .        .        .
Plant_C  .        .        200      .        .
Plant_D  .        .        .        200      .
Plant_E  200      .        .        .        200
-----------------------------------------------------

Consensus Map:
---------------
     LG   Map_length_.cM.  Markers.cM  Total.mrk  Max_gap
-------------------------------------------------------------
     lg1  78.15            1.599       125        1.09
     lg2  73.96            1.677       124        1.06
     lg3  81.58            1.483       121        3.65
     lg4  72.93            1.659       121        1.11
     lg5  81.9             1.404       115        3.36
     lg6  86.12            1.428       123        1.67
     lg7  72.08            1.734       125        1.99
     lg8  86.3             1.472       127        2.43
-------------------------------------------------------------
──────────────────────────────────────────────────
```

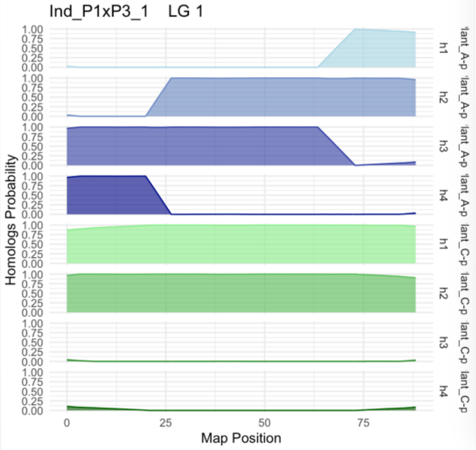




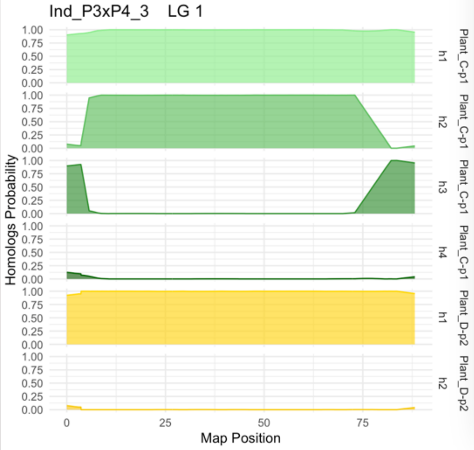
This project is funded by USDA NIFA Specialty Crop Research Initiative Award # 2020-51181-32156 (09/01/20 - 08/31/24)

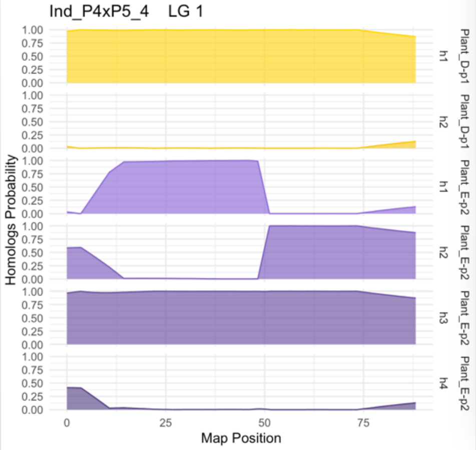
Haplotype probabilities

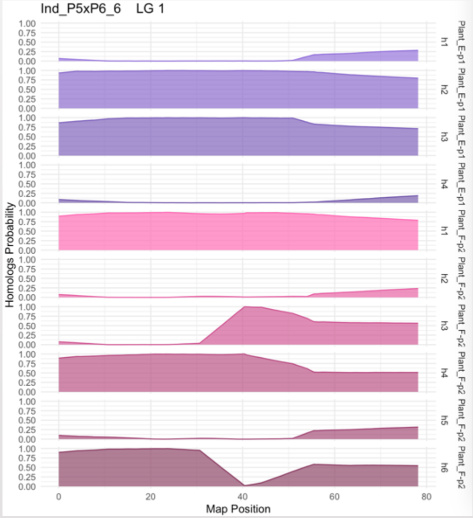


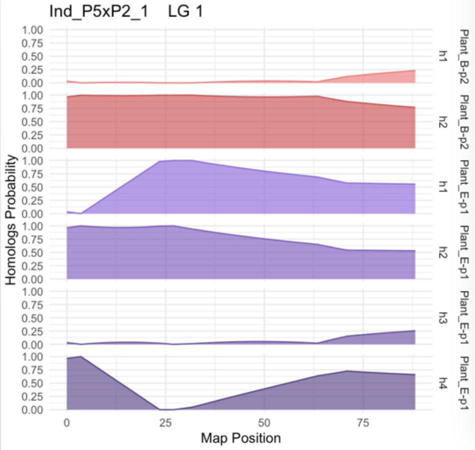


🟦 Plant A
🟥 Plant B
🟩 Plant C
🟨 Plant D
🟪 Plant E
🟥 Plant F









This project is funded by USDA NIFA Specialty Crop Research Initiative Award # 2020-51181-32156 (09/01/20 - 08/31/24)

Project Members

TEXAS A&M UNIVERSITY

Plant & Food™ Research
Rangahau Ahumāra Kai

Cornell University

WISCONSIN
UNIVERSITY OF WISCONSIN–MADISON

PennState

WAGENINGEN
UNIVERSITY & RESEARCH

WASHINGTON STATE UNIVERSITY

UNIVERSITY OF MINNESOTA
Driven to Discover®

NC STATE UNIVERSITY

1871
UNIVERSITY OF ARKANSAS

1865 THE UNIVERSITY OF MAINE

Oregon State University

TOOLS FOR POLYPLOIDS

USDA NIFA

This project is funded by USDA NIFA Specialty Crop Research Initiative Award # 2020-51181-32156 (09/01/20 - 08/31/24)

BILL & MELINDA GATES foundation

NC STATE UNIVERSITY

Other Collaborators

Genetwister
DAICEL arbor biosciences
VacCAP
Neuhouse Farms
bejo

Spring Meadow™
American Garden Rose Selections™
Plant Sciences Inc. PSI
Advancing Agriculture through Science
IITA
Transforming African Agriculture

CIAT
CIP INTERNATIONAL POTATO CENTER
Potatoes® USA
Woolf Roses L.L.C.
star® ROSES and PLANTS

Dekker chrysanten
BAILEY®
CSS FARMS
Weeks Roses
DÜMMEN ORANGE

illumina®
PACIFIC BERRY BREEDING
DELIFLOR Chrysanten
genVATIONS
Driscoll's®

TOOLS FOR POLYPLOIDS
USDA NIFA

This project is funded by USDA NIFA Specialty Crop Research Initiative Award # 2020-51181-32156 (09/01/20 - 08/31/24)

BILL & MELINDA GATES foundation
NC STATE UNIVERSITY